Name ______________________

Flame Test Lab

Date _______________________

Hour __________

**Purpose**: to observe and identify metallic ions using flame tests.

**Background**
Have you ever wondered why a candle flame is yellow? The characteristic yellow of a candle flame comes from the glow of burning carbon fragments. The carbon fragments are produced by the incomplete combustion of the wick and candle wax. When elements, such as carbon, are heated to high temperatures, some of their electrons are excited to higher energy levels. When these excited electrons fall back to lower energy levels, they release excess energy in packages of light called photons, or light quanta. The color of the emitted light depends on its energy. Blue light is more energetic than red light, for example. When heated, each element emits a characteristic pattern of light energies, which is useful for identifying the element. The characteristic colors of light produced when substances are heated in the flame of a gas burner are the basis of flame tests for several elements.

In this experiment, you will perform the flame tests used to identify several metallic elements.

**Safety**
The metal salts you will be using in this lab are poisonous. Avoid skin contact with these chemicals.
You will be using fire so tie back long hair and restrain loose clothing.
Wear goggles.

**Materials**:
Soaked wooden splints
Potassium nitrate
Calcium nitrate

Strontium nitrate
Lithium nitrate
Copper (II) nitrate

Sodium nitrate
Barium nitrate
Cobalt glass

**Procedure**
1. Obtain a set of metal salts and several soaked wooden splints.
2. Light and adjust a lab burner until you have a blue flame.
3. Taking one salt vial at a time, follow this procedure:
   a. Take a clean wooden splint and dip into the metal salt container to adhere a few crystals of the salt.
   b. Place the end of the wooden splint with the salt into the burner flame.
   c. Observe any color produced and record that in your data table.
   d. Remove the wooden splint from the flame (wet to extinguish if necessary).
   e. Place the used wooden splint into the match disposal can.
4. Repeat step 3 again with the sodium and potassium nitrate salts, this time viewing the color emitted through the cobalt glass.
5. Obtain an unknown salt from your teacher. Repeat step 3 with your unknown salt.
6. Clean up. Returning all equipment. Be sure lids are screwed back on to the vials they came from.

Data Table

<table>
<thead>
<tr>
<th>Ion Tested</th>
<th>Flame Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td></td>
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<tr>
<td>Barium</td>
<td></td>
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<td>Strontium</td>
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<tr>
<td>Lithium</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td></td>
</tr>
<tr>
<td>Sodium (with cobalt glass)</td>
<td></td>
</tr>
<tr>
<td>Potassium (with cobalt glass)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td>Unknown #</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion Hints:
Include the following questions and answers in your conclusion.
Which ions produced easily identifiable colors? Which ions produced the most intense color? Which elements are the least easily identifiable? What is the purpose of the cobalt glass?

Error Hints:
Would a flame test be useful in identifying mixtures of metallic ions?

GT Addition:
In this lab you observed that each elements emits a unique color of light. If examined through a prism, you would observe that the emitted light is actually composed of different wavelengths. This is called an emission spectrum. Find out what scientist’s use emission spectra for.